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ABSTRACT

The paper discusses the relationship between social structure and fertility behavior in man. Focusing upon human fertility within the context of varying social groups, the document reviews recent interdisciplinary population studies. Information and interpretations from biology, ethnology, anthropology, history, and sociology are presented in four chapters. Chapter I offers an historical analysis of the relationship of social structure to group size. Studies of animal groups indicate several common ways in which animals handle close contact, including aggression, submission, and moving to unoccupied territory. Serious overcrowding of animals results in various forms of social pathology, such as cannibalism, hyper-sexuality, and homosexuality. Chapter II describes and gives examples of fertility regulation in human groups. One hypothesis is that human groups do make attempts to control population for survival purposes. Another hypothesis is that they are more often inspired by concern for scarce objects which give status than for basic survival resources. Chapter III identifies variables affecting fertility, including factors affecting exposure to intercourse, gestation, and fetal and infant mortality. The final chapter discusses fertility in developing nations and examines implications for population policy formation. The conclusion is that policy makers must attempt to understand the many socioeconomic, environmental, and personal influences which affect fertility decisions. A list of references concludes the document. (Author/DB)

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A BIOSOCIAL VIEW OF POPULATION:

FERTILITY BEHAVIOR IN ANIMAL GROUPS

AND EARLY HUMAN SOCIETIES

A Review

A Paper From The Population Institute 110
Maryland Ave., N.E., Wash., D.C. 20002

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June 197

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PREFACE

This report contains no original research. It is indeed a review, an attempt to tie together several years of interdisciplinary studies of population phenomena. It represents what I consider to be crucial information and interpretations -- from biology, ethology, anthropology, history and sociology -- which bear upon human fertility within the context of varying social groups. While there are population books containing articles from many disciplines, I found it useful to write the salient observations of these different disciplines into one article. An outstanding model for such an integration is that of the American Association for the Advancement of Science: Culture and Population Change (AAAS, Washington, D.C.: 1974), which was most helpful in writing this review.

P.M.

DEDICATION

This paper is dedicated to Carol Fontein and David Baker of The Population Institute, Washington, D.C., for their continued encouragement; and to four professors at the University of Maryland: Stan Bennett, John Shiflett, David Kyle, and David Kruegel, all of whom opened new worlds of thought to me.

INTRODUCTION

This paper will attempt to describe the relationship between social structure and fertility behavior in man. Although birth and death are biologic events in the life of individuals, the particular society in which they take place will influence the timing and extent of these events just as these vital statistics will in turn influence the society; hence the term "bio-social." This kind of interaction is characteristic of the open systems of living things, and is most complex in human societies.[1]

Fertility control, contrary to widespread misinformation, is not a recent phenomenon, but -- if data from "primitive" groups can shed light on man's past -- is a very old cultural adaptation indeed, a response to changes in ecology, biology, opportunities and threat.[2] Examples will be given of fertility regulation in so-called primitive groups and an attempt will be made to explain the seeming lack of such regulation in the developing countries today.

In this paper, "culture" and "social structure" are used interchangeably to indicate hierarchies, statuses, castes, kinship systems, territorialities, structured competition or cooperation, rituals, common practices or norms of a given society. Fertility means demonstrated fecundity (the capacity to bear young); that is, conceptions which end in a live birth.

I. SOCIAL STRUCTURE AND GROUP SIZE: A HISTORICAL VIEW

The rapid growth of the human population is seen today as one of the most urgent and vexing problems mankind has ever faced.[3] At its current rate of growth, the world's population of 4 billion will double approximately every 35 years. The impact of such numbers of people in terms of food, land, natural resources, and pollution is thought by many to be beyond the carrying capacity of the planet.[4] The impact on worldwide economic, political, and social systems is contemplated with equal concern.[5]

This is a problem in many ways caused by success; it is the dramatic lowering of mortality rates -- not a rise in fertility -- that has caused the population to "explode." It hasn't always been this way.

For 98% of man's time on earth or more, he has lived as a hunter-gatherer. Perhaps at the beginning, the "population problem" was one of survival itself, the overcoming of enormous odds -- starvation, disease, predation, and exposure -- that would permit homo sapiens to continue as a species. As man's brain and culture evolved better ways of coping -- including language -- his mortality and fertility were probably only moderately high.[6] A crucial development in this early period was the adoption of agriculture about 10,000 years ago -- gradually bringing to an end nomadic wandering and assuring a steady, reliable source of food, thus making survival far more probable and enabling the small human population to grow at a quicker pace.[7] This pace, no doubt, varied from region to region according to environmental conditions, soil, disease, war, and social system.[8]

What arrangements for group living early man could already draw upon to accomodate his ever-larger numbers and what arrangements he later developed are in some ways the story of human cultural evolution itself and the rise of civilization.[9]

A. ANIMAL ANTECEDANTS

Group Size and Animal Social Structure

Animal studies -- especially of our closest relatives, the non-human primates -- reveal social structure which may have relevance to human population studies.[10] The extent of the relevance is the subject of intense debate, however,

and must be assessed with caution.[11] For example, sociobiologists have recently proposed a model to deal with "humanlike" behavioral patterns such as "altruistic" behavior toward close relatives, parental sacrifices for the young, and pair-bonding, which occur in many species, but are most common in mammals.[12] In primate societies, older siblings or aunts often care for the young and an orphaned chimpanzee will often be adopted by an older female relative. Dominance hierarchies are composed of closely related individuals, and a male's status depends on the rank of his mother.[13] These investigators believe that by helping close relatives, who share their genes, individuals may increase the likelihood that their genes would be represented in future populations; thus social systems evolve to increase the genetic fitness of individuals in their specific environment.[14] Is there, then, a genetic basis for the desire of many human beings to have children in order to "live on" through them, to carry out the family name? This theory, while gaining popularity, is by no means universally accepted.[15]

The specific environment is also important in determining the kind of adaptive social arrangements animals develop including those relevant to group size. John Eisenberg of the Smithsonian Institution suggests that there is a strong relationship between ecology and social structure (in primates). By this, he means that the availability of food and water, the amount of living space, and the intensity of predation threat are factors which affect social organization; for example, whether the troop will be large or small, one-male or multi-male, territorial or free-ranging.[16]

The numbers of animals in a group which occupy a certain ecological location must be large enough to insure their survival (against predators, for example) but not so large that the balance between resources and population is threatened. This population balance is maintained through a synthesis of opposing forces. On one hand, there are bonds of attraction, affiliation, attachment, and cooperation; and, on the other hand, there are forces of repulsion -- competition, aggression, dominance hierarchies, and territoriality.

Mechanisms for Group Living in Animals

Hans Kummer of the University of Zurich describes spacing mechanisms which are an important part of the regulation of animal social interactions.[17] Such mechanisms may -- or may not -- have counterparts in human behavior. One of the most familiar animal dispersing mechanisms is aggression and the response of escape. Distances between individuals vary among species and are further

differentiated according to sex. In humans, females tolerate high density more comfortably than males.[18]

At close range, social stimuli compel an animal to react, to communicate. By spacing out, an animal can protect itself from the constant social stimuli it feels in close contact. Constant communication among animals about spatial arrangement would be an exhausting and overstimulating method of handling intergroup space; thus animal societies tend to formalize relationships between its members and space. One of these formalizations is the territory: a field of repulsion (and sometimes attraction) fixed in space containing resources for specific activity. Territorial behavior is the rule where animals create needed resources, such as elaborate nesting sites, which then need defense.

Once aggression -- and victory therefrom -- decides who will occupy the choice sites, conflict becomes minimal. This is so, because the movements of owners become formalized, predictable, and reciprocally recognized in groups. Territoriality works against change because being on one's own territory enhances the assertive and bold behavior of the owner and thus enhances his chance against competitors. Conversely, confidence is diminished in leaving the territory and tendencies to migrate are reduced; thus territoriality acts as a stabilizing factor.

For animals who must dwell together on the same grounds, another factor in handling intragroup distance is submission. A weaker animal who must stay within a group will no longer seek escape in response to aggression, but instead will communicate its submissiveness by gesture to the aggressor (e.g., "presenting"). In patas monkeys, territoriality, even mobile territoriality by enforced distance, is the rule and intruder males are chased constantly. In gelada baboons, where dominance/submission is the rule, the vanquished challenger is approached by the victor with friendly gestures of lip-smacking. The victor continues until the loser finally presents his rear as a gesture of submission. From then on, friendly gestures and mutual grooming characterize the relationship. Thus dominance hierarchies permit gelada males to live together in large groups.

When Group Size Increases

A group of only a certain size can manage to learn and recognize the complex interrelationships in dominance hierarchies; after a certain point, intragroup aggression is diverted toward approaching outsiders. This diverted aggression

strengthens cohesion within the group and keeps outsiders from joining the group and increasing its size. In this way, relatively stable group size is maintained.

In a group with a large population, spacing-out alone as a method of handling space is inadequate since in order to maintain a "proper" distance from animal A, an individual will have to come too close to animal B or C. One technique of handling this closeness is to interrupt visual communication by hiding or by occupying an inconspicuous position. Dominant animals, on the contrary, impose their visual effects by choosing conspicuous places. Weaker animals also can avoid direct communication with the dominant by looking away, another substitute for "keeping one's distance."[19]

"Cooperation" Among Animals

In contrast to the mechanisms which maintain distances and assure the "fittest" or most dominant animals first access to mating, food, or nesting resources, there are mechanisms of attraction, some of which are mediated by hormones, such as mating, and maternal behavior (most intense during lactation). The "cooperation" among kin in child-rearing and in maintaining a favorable ranking in dominance hierarchies has already been noted. Ethologist John Crook of the University of Bristol believes that the genetic advantage of kinship affiliation may underlie human kinship systems.

Crook reports that "Cooperative behavior in birds and mammals occurs in a number of contexts, but particularly in relation to food storage, territorial defense, mutual protection against predators, in group hunting, in parental care, and also in infant care by individuals other than the actual parents, and, finally, at its most complex in the cooperative control of social interaction in certain primate groups."[20]

It is interesting to note that cooperation occurs within social contexts marked by dominance hierarchies and competitiveness. Competition and cooperation, like aggression and submission, seem then to be necessary social dynamics rather than opposites. Crook notes that the cooperation of a whole group is highest when the group is competing with an outside group, and for individuals within a group, it is highest when kin cooperate in order to compete better with others. Crook regrets that such group processes as cooperation, which he believes may be the evolutionary basis of human culture, have been largely ignored in favor of a neo-Darwinian approach to behavioral evolution as an individual process.

Overcrowding in Animals

What happens to the complex network of social regulation when the group becomes overcrowded? This is a difficult question to answer using animal models from the wild because the various mechanisms of group life militate toward balance with gradual fluctuations of population size. Biological factors are important in this respect also. For example, a female chimpanzee bears offspring at 5 year intervals, although she comes into estrus yearly. (This is thought to be due to the ovulation-suppressing effects of lactation which is lengthy in the chimpanzee).[21] Emigration and the development of new subgroups will occur where there are resources to support the splinter group. In primates, territoriality, dominance, and aggression are greatly intensified when a resource becomes scarce in relation to group size. When resources are plentiful, competition is minimal and hierarchies are less in evidence.[22] Edward O. Wilson reports that adult hippos -- who rarely fight when densities are low -- fight viciously, sometimes to the death, when drought conditions limit access to water.

Such events are rare in the wild, due to the many alternatives such as group-splitting. In captivity, however, crowding leads to social pathology. Wilson refers us to a study by Leyhausen (1965) of the behavior of cats subjected to unnatural crowding: "The more crowded the cage is, the less relative hierarchy there is. Eventually a despot emerges, 'pariahs' appear driven to frenzy and all kinds of neurotic behavior by continuous and pitiless attack from all the others; the community turns into a spiteful mob. They all seldom relax, they never look at ease, and there is continuous hissing, growling, and even fighting. Play stops altogether and locomotion and exercise are reduced to a minimum."[23]

Perhaps the most famous description of the results of overcrowding is that of John Calhoun's rats. In addition to the aggressive behavior described above, some of the rats displayed hyper-sexuality and homosexuality and engaged in cannibalism. Nest construction was atypical and nonfunctional, females became abnormally aggressive, and infant mortality among the more disturbed mothers ran as high as 96 per cent. Even when group size was reduced by mortality, the remaining rats succumbed to stress and died.[24]

Other forms of social pathology such as the eating of infants have been observed in hamadryas baboons and langur monkeys under crowded conditions. In rhesus macaques, the constant introduction of strangers to the cage raised aggression even more than high density alone did. Jonathan Freedman in a review of the effects of density concluded that in animals, dealing with large numbers

of individuals, rather than density per se, was responsible for the signs of stress and aggression exhibited when group size increased.[25]

It is tempting to draw direct parallels to human reactions to crowding. It must be cautioned again, however, that it is not clear what, if any, social behavioral mechanisms humans have inherited from their primate ancestors. Certainly today's complex urban world of the computer and condominium bears little resemblance to the forest of chimpanzees. It is reasonable that we would feel more confident looking at early human populations for antecedants of human social structure.

B. A STONE AGE TRIBE CHANGES RAPIDLY

A report in Science describes a present-day tribe which may resemble our Stone Age ancestors and may provide us with information about early human social structure and fertility behavior:

> "If results from recent studies of the !Kung people apply to other societies, anthropologists may now have some new clues as to the social, dietary, and demographic changes that took place during the Neolithic Revolution when people forsook lives of hunting and gathering and began to farm and to keep herds of domestic animals. The !Kung have lived as hunters and gatherers in the Kalahari Desert of South Africa for at least 11,000 years; but recently they have begun to live in agrarian villages near those of Bantus. Investigators who are documenting this change find that, among other things, the settled !Kung women are losing their egalitarian status, the children are no longer brought up to be non-aggressive, and the size of the !Kung population is rapidly increasing rather than remaining stable."[26]

The !Kung have lived by hunting and gathering since the Pleistocene and have continued until as recently at 10 years ago. Now, less than 5% of the 30,000 (i.e., approximately 1,500) live in this way; the others live in agricultural villages. During this time of rapid change, extensive studies of the !Kung have been carried on by investigators representing many countries and disciplines.

It is not clear what changes are due to settling down itself and what are due to the influence of Bantu society. Investigators have longitudinal studies of the nomadic !Kung with which to contrast present practices.

The nomadic women enjoy higher status, more autonomy and more participation in group decision-making than do the sedentary !Kung women. This may be due to

the fact that the nomadic women contribute, by gathering, at least 50% of the food consumed by the band. Women are as mobile as the hunting men and are away from the camp as often. Both men and women who are not food-seeking on a given day remain at camp and share in child care.

In contrast, the agrarian women are far less mobile and contribute less to the food supply. The men leave the village to farm and to tend the cattle of the nearby Bantus. Women remain in the village to prepare food and to maintain the shelters. Since the men deal with Bantus, they alone have learned the Bantu language, and thus when the Bantus have dealings with the !Kung, they deal only with the men. The Bantu society is male-dominated and imitation of it may contribute to the change in status for !Kung women.

The socialization of children reveals similar changes. Because the nomads live in bands of very few people, a child generally has no companions of his own age. Play groups consist of both sexes and many ages, which discourages the development of distinct games or role-playing for boys and girls. The agrarian children, however, play in groups of same sex and similar ages. The boys are expected to herd cattle and leave the village where they are away from adults. The girls remain in the villages and help the women with chores.

The nomadic !Kung also discourage aggressiveness among their children, quickly stopping such behavior when it occurs and providing no model for aggression in their own actions. There is no structure to deal with conflict; when it occurs, families leave for other bands. Among the sedentary !Kung, in contrast, the children play competitive games and adult conflict is resolved by Bantu mediation.

Of great interest are the changes in diet and what appear to be closely related changes in fertility rates between the nomadic and agrarian !Kung. The nomadic diet consists of nuts, vegetables, and meat and lacks milk and grain. The sedentary !Kung are found to be taller, fatter, and heavier than the nomads, and the girls experience menarche earlier. Both groups marry at puberty but the nomads do not have their first baby until approximately 19.5 years of age. The average length of time between births is 4 years. There is no contraception or abortion and the nomad population remains stable due to the low fertility of its women. This is in contrast to previous theories that hunter-gatherers were limited in population due to high mortality. The long-term growth rate for such a population is only .5% per year as opposed to the agrarian !Kung whose population is growing rapidly.

Studies by Harvard researcher Rose Frisch and others suggest an explanation for both the fact that menstruation begins earlier and birth intervals drop 30% when !Kung women become sedentary. Frisch found that the amount of body fat must be above a certain minimum (a height/weight ratio) for the onset of menstruation and its maintenance after menarche. The !Kung hunter-gatherers are thin, although well-nourished. During the 3 or 4 years that a woman nurses her child, she needs about 1,000 extra calories a day and thus may have too little body fat for ovulation to take place. The shorter periods of lactation and larger amounts of body fat among the agrarian women may account for the shorter birth intervals and subsequent rapid population growth.

Studies of the !Kung are providing anthropologists with information which may help to shed light on the origins of modern, complex societies and the interactions of ecology, biology, and culture which impelled them on their way. Whether the agrarian !Kung, whose population is now growing rapidly will develop within their society one or more of the mechanisms of population regulation seen in almost all pre-industrial groups will be of great interest.[27]

II. FERTILITY REGULATION IN LATER HUMAN GROUPS

A. THE THEORY OF FERTILITY REGULATION AND STATUS

In 1962, Wynne-Edwards published Animal Dispersions in Relation to Social Behavior in which he introduced the notion of "optimum population" in primitive groups. He used an analogy to homeostasis in physiology to explain what otherwise appears to be functionless behavior as a contribution to population control; he also cited animal controls such as territoriality, and dominance hierarchies which limit density, feeding, or breeding.[28]

Mary Douglas, however, objects to the idea of optimal population which implies some absolute criterion such as survival; optimal size must be defined in relation to the demands on a particular resource which is perceived as important to the group and which is not necessarily critical to survival, she contends. Moreover, she observes, the homeostatic theory of population control obviously does not work -- or else we wouldn't have population explosions in India, Africa, and elsewhere. Douglas' hypothesis is that "....it is the demand for oysters and

champagne, not basic bread and butter, that triggers off social conventions which hold down human populations."[29] Human groups do make attempts to control population but are more often inspired by concern for scarce social resources, for objects which give status, than for basic resources.

B. Examples of Fertility Regulation in "Primitive Peoples"

Douglas does not deny that where survival itself is at stake, population control measures may be very direct, but even then social status regulates such practices, such as female infanticide among the Netsilik Eskimos of Pelly Bay. In 1923, an anthropologist named Rasmussen noted 38 cases of female infanticide out of 96 births. He was also struck by the social friction involving competition for women, including fighting and sometimes killing, and wondered if infanticide would threaten the survival of the group.

After a long-term study, another anthropologist, Balicki, argued that the practice is a more flexible and sensitive instrument of demographic policy than it seems. The hunting and fishing economy of Eskimos demanded a strict division of labor and males were much favored for the rigorous and dangerous work they could perform and upon which survival depended. First-born girls were considered good luck, but later-born girls were considered a hindrance and were left out to die of exposure (before a naming ceremony made them "people"). A girl might be spared only if a future husband would betroth her or if her grandmothers would adopt her as old age security. Balicki noted that although female infanticide unbalanced the sex ratios of infants, at adulthood the sexes were evenly balanced, due to the high mortality rates for men.

The Rendille, camel herders in Kenya, live on the meat and milk of herds of camels (sometimes supplemented with sheep and goats); because camel herds increase very slowly, the Rendille are aware that a stable human population is desirable, large enough to maintain the herds but not too large. The Rendille deal with overpopulation by 1) emigration, especially to the cattle-herding Samburu tribe; 2) monogamy (this does not automatically reduce fertility in all groups, however);[30] 3) late age of marriage for women; and 4) by killing off boys born on Wednesdays or after the circumcision of the eldest brother, ostensibly to avoid jealousy between the brothers since the herd is passed on only to the eldest son. This male infanticide creates a surplus of Rendille women, who then leave the tribe to marry neighboring Samburus. Clearly, limiting the number of women in the tribe further reduces fertility. Possession of camels is a sign of adulthood and power, and is in rigid control of the elders, who exercise a rigid and strict

discipline in the tribe. Thus, while camels may be in fact the key to Rendille's physical survival, they are also the symbol of status and political power -- and that may be why there is successful population control.

A third group Douglas discusses are the Pacific islanders of Tikopia, a small island 700 miles from the nearest large island; emigration was not a practical means of population regulation. Therefore, there was strong social disapproval for families larger than two or at most three children; contraception, abortion, and infanticide were practiced as well as putting out to sea "undesirables" such as thieves. The Tikopians lived on fish, taro, yams, and coconuts. The coconuts were considered very valuable because the milk was used to season other food, but the chief use was for feasts and religious ceremonies, the basis of Tikopian social life. Firth, an anthropologist, noted that while the islanders cooperated in fishing and farming, they would fight over coconuts. He concluded that it was the status of coconuts, not the fear of famine, which prompted population regulation, a non-Malthusian interpretation (Malthus held that population fluctuates only in response to food levels).

The last group Douglas considers are not primitive people, but are one of the richest land-owning castes of India, the Nambudiri Brahmins. To maintain their social and economic advantage, they avoid dividing their estates, allowing only the eldest son to inherit and to marry; he then owns the land and administers it on behalf of his brothers, who are now allowed to marry. Also, only one daughter is allowed to marry. The other sons may consort with lower-caste women but the non-marrying daughters are kept in strictest seclusion. Douglas summarizes: "Policies of control develop when a smaller family appears to give relative social advantage."[31]

Other groups demonstrate fertility regulation in response to social goals or pressures. For example, Edward Hoebel mentions the extreme practice of the Cheyenne Indians early in this century: "It has long been a custom that a woman should not have a second child until her first is 10 years old." This was accomplished by rigorous abstinence. A chief told Hoebel that the desire to raise his son in the best possible manner was the guiding purpose of this self-denial. Infrequently, the abstinence rule was broken and abortion would be invoked if pregnancy resulted.[32]

Abortion, in fact, is a very old and common method of direct fertility regulation, as is infanticide, incomplete intercourse, abstinence, and use of mechanical contraception.[33] Some early direct birth control methods were probably

effective, such as the cloth diaphragm soaked in acacia tips (which actually release an effective spermicide) described in an Egyptian papyrus of 1850 B.C.; some were no doubt ineffective such as the Mohammedan suggestion to women of jumping forward after intercourse to increase fertility and backward to decrease it.[34]

These methods of fertility regulation intertwine with and vary with biologic and cultural features of specific societies, such as length of lactation, which will affect fecundity, or taboos against remarriage of widows (India), which will affect fertility levels in societies where young girls marry much older men.

Judith Blake and Kingsley Davis have compiled a list of twelve intervening variables that form the connection between a group's social institutions and norms and their actual biologic fertility.[35] It is a helpful framework with which to examine a particular group in terms of the likelihood of high or low fertility -- and perhaps in terms of the ease or difficulty in changing it.

III. ELEVEN VARIABLES AFFECTING FERTILITY[36]

I. Factors Affecting Exposure to Intercourse

A. Formation and Dissolution of Unions During Reproductive Period

1. Age of entry into sexual unions

2. Permanent celibacy: the percentage of women never entering sexual unions

3. Amount of reproductive period spent after or between sexual unions by divorce, or death

B. Exposure to Intercourse Within Unions

4. Voluntary abstinence

5. Involuntary abstinence (impotence, illness, temporary separations)

6. Coital frequency

II. Factors Affecting Exposure to Conception

7. Fecundity or infecundity as affected involuntarily

8. Use or non-use of contraception

   a. By mechanical means

   b. By non-mechanical means

9. Voluntary infecundity (sterilization)

III. Factors Affecting Gestation and Successful Parturition

10. Fetal mortality from involuntary causes

11. Fetal or infant mortality from voluntary causes (abortion or infanticide)

IV. FERTILITY IN THE DEVELOPING COUNTRIES TODAY

A. PERCEIVED BENEFITS OF HIGH FERTILITY

Interest in anthropologic studies of fertility is high today because most of the rapid growth of population occurs in the less-developed countries, where most of the people still live in traditional, non-urban social units. An understanding of the varieties of cultural patterns which affect fertility seems essential before governments undertake to reduce their countries' fertility levels; research suggests that family planning services alone are inadequate.[37] Ronald Freeman points out that in each society, the cultural norms about family size, marriage, timing of intercourse and abortion are "consistent with the social institutions in which they are embedded. Changes in fertility are unlikely without prior or, at least, simultaneous changes in these institutions."[38]

Even though mortality has dropped rapidly and significantly in the less-developed countries (mainly due to intervention of modern medicine, pesticides and technology), fertility levels have remained high. This has greatly puzzled demographers who believe that developing countries should follow the classic pattern of the Demographic Transition: that is, after a period of population growth, economic development will lower birth rates, which will eventually be brought into balance with the death rates, a descriptive history of the Western industrialized countries and Japan. Such changes may take place when the population change is gradual and responses to it derive from within the culture; too rapid

population growth may in many ways invalidate the expectations of the theory of Demographic Transition.

It may be that a time lag is responsible for continued high fertility. While a moderate reduction in infant or child mortality may have explosive demographic implications for a nation, such changes may not be readily apparent to villagers or may be interpreted as temporary. Freedman notes that "If kinship ties are very important in a society where mortality is high and variable, the number of births desired and produced will be especially high to insure the survival to adulthood of the essential number of children."[39] These kinship ties often involve production, consumption, leisure activity, assistance in old age and illness, and status in cultures where male heirs are a symbol of pride. It is inevitable that such deeply ingrained social systems will not change overnight.

In fact, some development has actually led to an increase in fertility "as many families have more children in transitional economies so that they produce more or earn more wages and thus increase family income."[40] Another ironic aspect of the transition theory is that there exists a "vicious circle": the theory says that economic development will reduce fertility, but rapid population growth has wiped out the benefits of economic development; per capita income has not risen; therefore, fertility will not decline.

In addition to the persistence of high fertility rates (which were adaptive until Western intervention suddenly changed mortality rates), some of the ancient cultural constraints on fertility have broken down, yielding still higher birth rates. For example, Mary Ainsworth of Johns Hopkins reported that after missionaries converted a North African tribe to Christianity, the tribe dropped its taboo on intercourse during the time of lactation (which had been two years) while powdered milk replaced breastfeeding among many of the women. The birth intervals then fell from over three years to under one year, leading to social stress, hunger and break-up of the tribe.[41] In other instances where long breastfeeding traditions have been dropped, a rise in fertility has followed.

Where population is outrunning the immediately available resource, society responds by tightening its kinship ties and by restricting access to resources to the "haves" of society. Lester Brown has noted that economic gains in the crowded developing countries have been limited to certain classes and families; the gap between rich and poor is actually widening in these countries in spite of considerable economic growth.[42]

B. BREAKDOWN IN SOCIAL STRUCTURE

In some areas, population has so outstripped resources that social structure has disintegrated. This is true in some areas of India where in the 1970's literally millions have succombed to famine.[43] Harvard nutritionist Jean Mayer describes the effects of famine on a society: "It is very clear that death from starvation occurs first of all in young children and in the elderly, with adolescents and adults surviving better (pregnant women often abort; lactating mothers cease to have milk and the babies die).... In addition, a general consequence of famine is a state of social disruption (including panic). People who are starving at home tend to leave, if they can, and march toward the area where it is rumored food is available. This increases the prevailing chaos. Families are separated and children are lost -- and in all likelihood die. Adolescents are particularly threatened by tuberculosis; however, finding themselves on their own, they often band together in foraging gangs, which avoid starvation but create additional disruption...."[44]

C. THE FUTURE: IMPLICATIONS FOR POLICY

It becomes clear that development in itself -- especially where the main impact has been to lower death rates alone -- may not only fail to help, but may have serious and unintended consequences for its recipients. Lower fertility has resulted from some development however. Where machinery has been used instead of farm labor, farm owners have reduced their family size. Where women are incorporated into the labor force, where women obtain more than five years' education and where economic gain has been more evenly distributed, fertility has declined.[45] In a re-examination of the European Demographic Transition that took place during the 18th and 19th centuries, Ansley Coale analyzed data from more than 700 provinces. He found that the model of development leading to reduced mortality and then to reduced fertility did not hold in many provinces. However, he advanced three preconditions to a reduction in fertility: 1) potential parents must consider fertility control an acceptable mode of thought and behavior; 2) couples must perceive reduced fertility as advantageous; and 3) effective measures of fertility regulation must be available.[46]

These changes take place within specific cultural settings; the implications of anthropologic studies of fertility, then, is that population policies must take

into account the varieties of cultures it wishes to influence, in order to have the intended effect. Such understanding will of course require trained personnel and adequate methods of research and assessment. "Families make their fertility decisions within their immediate socioeconomic environment, of which there may be many in the national context," concludes a task force of the American Association for the Advancement of Science. "Only by understanding the many varied environments, and shaping policy to adapt to them, can policy makers hope to influence such personal decisions as fertility."[17]

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